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TOMIZO ENDO

(54) VALVE

(71) We, KUREHA KAGAKU KOGYO KABUSHIKI KAISHA, a Japanese body corporate of No. 8, Horidome-cho 1-chome, Nihonbashi, Chuo-ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to valves for controlling the flow rate of hot pitch or other viscous materials.

A problem which we have encountered in seeking to control the flow rate of hot pitch at about 300-400°C is that a rod coupled to the valve member of a flow regulator valve tends to seize in its guide due to intrusion of hot sticky pitch in the small clearance between the valve rod and the rod guide. We have found that this problem cannot be solved simply by increasing the diameter of the rod guide aperture which slidably receives the valve rod.

According to the present invention, there is provided a flow control valve for hot pitch or other viscous material, in which the valve member is fixed to a valve rod which is guided in an aperture of a guide member, which aperture is shaped to define a number of narrow axially extending ridges around the circumference of the valve rod for linear guiding sliding contact therewith.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings, in which

Figure 1 is a longitudinal section of a stop valve suitable for controlling flow rate of hot viscous pitch;

Figure 2 is a diagrammatic view of a valve rod guide;

Figure 3 is a view similar to Figure 2 but showing a valve rod guide which when used in the arrangement of Figure 1 provides an embodiment of valve according to the present invention; and

Figure 4 is a diagrammatic view of a valve rod guide with a modified aperture pattern, also useable in an embodiment of valve in accordance with this invention.

The stop valve shown in Figure 1 is of a simple construction. The valve includes a housing 1 which defines a fluid chamber 22 therewithin which is in communication with an inlet 2 and also with an outlet 3 through a port 4 forming a valve seat and a lower chamber 21. The housing 1 further includes an upper cylindrical cavity 23 with an annular flange at the upper end thereof.

The open area of the valve seat 4 is controlled by a valve member 5 of a truncated cone shape. The valve member 5 is mounted on a rod which extends axially outwardly through the upper cavity 23 and is coupled to an actuator 11 which is arranged to operate the valve by movement of member 5 toward and away from the valve seat 4 to attain a desired fluid flow rate from inlet 2 to outlet 3 in the usual manner. A packing box 8 accommodating packing 9 is rigidly mounted between the upper flanged end of the upper cavity 23 and the actuator 11.

The axial movement of the valve rod 6 is guided by a valve rod guide 7 which is mounted on a stepped surface at the bottom of the upper cavity 23 and a packing gland 10 at the upper end of the packing box 8. Figure 2 shows a cylindrical plate 7*A* which we have rejected for use as the valve rod guide 7 in our valves for controlling the flow rate of pitch and other viscous materials. Plate 7*A* has a round aperture of a diameter slightly larger than the diameter of the valve rod 6 for relative slide movement.

We have found that the valve rod guide arrangement of Figure 2 works without troubles as long as the fluid has low viscosity and suitable lubricating properties. However, when feeding hot viscous pitch at 300-400°C or other highly viscous fluid, we find

that the valve rod 6 is easily seized and stuck in the valve rod guide 7*A* by the viscous fluid which intrudes into the small clearance between the valve rod 6 and the rod guide 7*A*. A mere increase of the guide aperture diameter does not solve the problem and leads to further problem of unstable guidance.

In contrast, there is shown in Figure 3 a rod guide 7*B* which may be used in an embodiment of valve in accordance with this invention and which is also in the form of a cylinder but provided instead with a guide aperture G of cross-section substantially greater than that of rod 6 and having a number of radially inwardly directed portions defining narrow axial ridges around the circumference of the valve rod 6. As will be clear from Figure 3, guide aperture G has a cross-section of about four times the cross-section of rod 6.

In operation, the axial movement of the valve rod 6 is guided by the axial narrow ridges of the rod guide 7*B* which are in sliding contact in a relative linear fashion with the circumference of the valve rod 6. We have found that this arrangement avoids the above-mentioned problem of rod seizure.

Figure 4 shows at 7*C* a modification of the rod guide of Figure 3 where the radial indentations are greater in number and have their depths increased to present a guide aperture G patterned like flower petals and having a cross-section of about seven times the cross-section of rod 6. In a similar fashion to the Figure 3 arrangement, the narrow guide ridges between the deepened radial indentations are disposed around the valve rod 6 to provide linear contact therewith.

WHAT WE CLAIM IS:-

1. A flow control valve for hot pitch or other viscous material in which the valve member is fixed to a valve rod which is guided in an aperture of a guide member, which aperture is shaped to define a number of narrow axially extending ridges around the circumference of the valve rod for linear guiding sliding contact therewith.

2. A valve according to Claim 1, wherein the guide member is exposed to material flowing through said valve in all positions of the valve between fully open and fully closed.

3. A valve according to Claim 1, and comprising a housing having an inlet and an outlet and interiorly defining a fluid chamber in communication with said inlet, a valve seat provided centrally at the bottom of said fluid chamber to intercommunicate said fluid chamber with said outlet, and a cylindrical cavity provided contiguously and above said fluid chamber coaxially with said valve seat; said valve rod extending axially through said cylindrical cavity for connection to an actuator for operation of said valve by movement of the valve rod and valve member toward and away from said valve seat to control the flow rate of viscous fluid flowing from said inlet to said outlet through said fluid chamber; and said guide member being mounted securely in said cylindrical cavity and having a pierced cylinder form.

4. A valve according to any preceding claim, wherein the guide member aperture has a cross-section of four or more times the cross-section of the valve rod.

5. For hot pitch or other viscous material, a flow control valve substantially as hereinbefore described with reference to and as shown in Figures 1 and 3 or 1 and 4 of the accompanying drawings.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

FIG.1

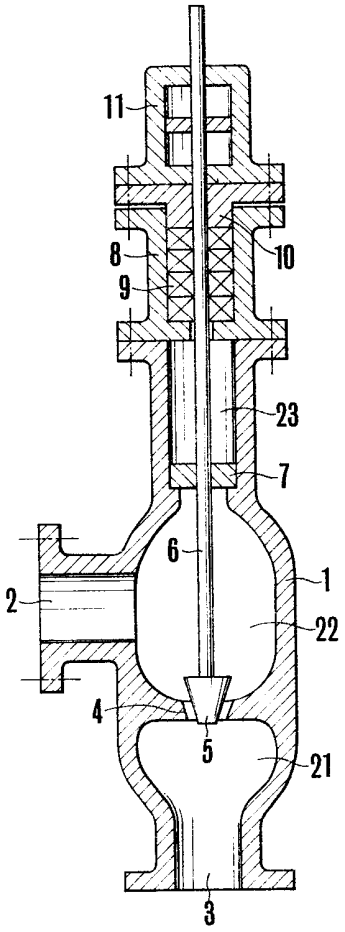

FIG.2

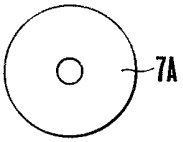

FIG.3

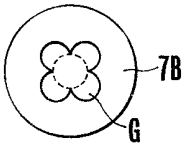

FIG.4